1. (Amended) A method for determining the temperature T at at least one location on the surface of a sample, comprising the steps:

(a) measuring, at an oblique take-off angle and at at least one wavelength ν, radiance at at least two linearly independent polarizations p1 and p2;

(b) computing a polarized radiance ratio $R_{p1}(\nu)/R_{p2}(\nu)$ of said measured radiances $R_{p1}(\nu)$, $R_{p2}(\nu)$ to determine the associated polarized emissivity ratio $\epsilon_{p1}(\nu)/\epsilon_{p2}(\nu)$, in accordance with the relationship $R_{p1}(\nu)/R_{p2}(\nu) = \epsilon_{p1}(\nu)/\epsilon_{p2}(\nu)$;

(c) applying at least one additional constraint to compute the value of at least one of the emissivities, $\epsilon_{p1}(\nu)$, $\epsilon_{p2}(\nu)$, constituting said polarized emissivity ratio;

(d) determining the temperature T at said one location by solving the equation:

$$R_{p1}(\nu,T) = \epsilon_{p1}(\nu T) \times P(\nu,T),$$

wherein $P(\nu,T)$ is the Planck function;

(e) irradiating said surface with radiation including said wavelength ν, and measuring reflectance ρ from said surface at said wavelength ν and said polarizations p1 and p2 to thereby determine the reflectance-derived ratio $1-\epsilon_{p1}(\nu)/1-\epsilon_{p2}(\nu)$; and

(f) applying said reflectance-derived ratio as said at least one additional constraint in said step (c) for computing said at least one emissivity value.

9. (Amended) A method for determining the emissivity ϵ at at least one location on the surface of a sample, comprising the steps:

(a) measuring, at an oblique take-off angle and at at least one wavelength ν, radiance at at least two linearly independent polarizations p1 and p2;

(b) computing a polarized radiance ratio $R_{p1}(\nu)/R_{p2}(\nu)$ of said measured radiances $R_{p1}(\nu)$, $R_{p2}(\nu)$ to determine the associated polarized emissivity ratio $\epsilon_{p1}(\nu)/\epsilon_{p2}(\nu)$, in accordance with the relationship $R_{p1}(\nu)/R_{p2}(\nu) = \epsilon_{p1}(\nu)/\epsilon_{p2}(\nu)$;

(c) applying at least one additional constraint to compute the value of at least one of the emissivities, $\epsilon_{p1}(\nu)$, $\epsilon_{p2}(\nu)$, constituting said polarized emissivity ratio;

(d) irradiating said surface with radiation including said wavelength ν, and measuring reflectance ρ from said surface at said wavelength ν and said polarizations p1 and p2 to thereby determine the reflectance-derived ratio $1-\epsilon_{p1}(\nu)/1-\epsilon_{p2}(\nu)$; and

(e) applying said reflectance-derived ratio as said at least one additional constraint in said step (c) for computing said at least one emissivity value.

13. (Amended) Apparatus for determining at least one emissivity value ϵ from a surface of a simple, comprising a radiance sensor including a radiation detector, polarization selective means, wavelength selective means, and electronic data processing means, said sensor being configured for carrying out the following steps:

(a) measuring, at an oblique take-off angle and at at least one wavelength ν, radiance at at least two linearly independent polarizations p1 and p2;

(b) computing a polarized radiance ratio $R_{p1}(\nu)/R_{p2}(\nu)$ of said measured radiances $R_{p1}(\nu)$, $R_{p2}(\nu)$ to determine the associated polarized emissivity ratio $\epsilon_{p1}(\nu)/\epsilon_{p2}(\nu)$, in accordance with the relationship $R_{p1}(\nu)/R_{p2}(\nu) = \epsilon_{p1}(\nu)/\epsilon_{p2}(\nu)$;

(c) applying at least one additional constraint to compute the value of at least one of the emissivities, $\epsilon_{p1}(\nu)$, $\epsilon_{p2}(\nu)$, constituting said polarized emissivity ratio;

(d) measuring reflectance ρ from said surface at said wavelength ν and said polarizations p1 and p2 to thereby determine the reflectance-derived ratio $1-\epsilon_{p1}(\nu)/1-\epsilon_{p2}(\nu)$; and

(e) applying said reflectance-derived ratio as said at least one additional constraint in said step (c) for computing said at least one emissivity value.